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Examining the Ergonomic Aspects of Sports Equipment Located in Open Spaces and Urban Parks with a Risk Management Approach

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Abstract

The purpose of this research is to evaluate the ergonomics of sports equipment located in parks and public spaces in Tehran. For this purpose, 4 areas of Tehran municipality were selected as study sites and 2 parks and 2 recreation areas were selected from each. Three devices were evaluated. REBA technique was used for posture assessment and William Fine method was used for risk assessment. Three devices were evaluated. The REBA technique was used to assess posture and the William fine method was used to assess risk. The PMBOK, 2000 model was also used to provide risk reduction solutions. The results of the posture evaluation show that working with the Rotary ship rudder has a very high risk (the risk number is higher than 13). After that, the device "leg and underarm Press" has a high risk level (risk number 9). Finally, the "elliptical" device has an average risk level (risk number 6). The rank and risk level of the sports equipment studied were evaluated based on 2 separate methods. The results indicate that in both evaluation methods, the lowest level of risk assessed belonged to the elliptical device. But the results of the methods used differ between the highest risk levels assessed for the sports devices studied. So in the posture assessment method (REBA), the ship's Rudder had the highest degree of risk (very high), while according to the William fine assessment method, the leg and underarm Press showed the highest level of risk. General solutions for risk management include: aggressive, defensive, conservative and combined solutions.

Keywords: Ergonomic evaluation, Sports users, Risk level, Sports equipment, Urban park.

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1. Introduction

Industrial life has led managers and planners to pay special attention to dealing with the unpleasant consequences of lack of mobility (Kashf and Hussainpur, 2012). To escape today's problems, people turn to spaces to improve their mental and mental fatigue (Ilbeigi et al., 2013). Gardens and parks, with such characteristics, both promote health and aesthetic understanding and provide a calm atmosphere for communication with others (Lee et al., 2016; Daneshyar et al., 2023). As a result, such spaces can be the most suitable place for leisure, sports and recreation activities and social interactions (Takano, 2017). Today, in many countries, the existence of sports spaces is considered a right of citizenship. Sports activities have an important impact on the physical and mental health of individuals and consequently the community, so any step taken to increase the possibilities of addressing these activities is appreciated. In Iran, one of the activities that has been carried out in this field in recent years is the installation of sports equipment in parks and public sports spaces so that citizens can be encouraged to use these devices. The first park bodybuilding machines were built in China in 1998 and installed in Iran in 1984 (Sadiki Naini et al., 2021). In recent years, sports equipment has been installed in public places, especially parks, reflecting the attention of city officials to sports. In the meantime, the design, manufacture and installation of sports equipment to increase physical and muscle strength, create activity and server among citizens are important things to consider (Hussainpour et al., 2019). In fact, installing sports equipment in parks is an effective step towards the development of Citizen Sports. Because the prevailing idea is that these devices and equipment help citizens maintain their physical and mental health at the lowest cost and facilities.

Although the use of devices in parks and parks is acceptable, it is very important to observe the scientific and technical standards associated with them (Gushgarh, 2003; Daneshyar et al., 2022). It should be noted that the devices in the parks are intended for physical fitness and are not treatable at all. Therefore, people with skeletal - muscular problems should not use them to heal the disease. Aerobic exercises such as bicycles or marches, muscle strengthening exercises, joint flexibility and balance movements are four important components in the health-oriented exercise program in parks, on which such equipment and devices should also be designed and installed. Studies have shown that in many parks and parks, these principles are not properly followed. These deficiencies range from the main standards, such as the installation of a bulletin board for each device to the training of the method of Use and related warnings (Hussainpour et al., 2019). But some sports experts believe that because most users of these devices are people

who do not exercise professionally and do not know how to use these devices, it is likely that the use of these devices will cause them all kinds of problems (Hussainpour and colleagues, 2019).
In relation to ergonomic factors, we can mention the design of the work environment and activities.That is, the design of the environment should be in such a way that it is appropriate for the characteristics of the person and the person does not suffer from various disorders, including skeletal – muscular disorders. Work - related musculoskeletal disorders (WMSDs) are the main cause of loss of working time, increased costs and damage to human resources, and are one of the biggest occupational health problems in industrial countries, and are among the most important issues faced by economists around the world (Al-Madani and Awad, 2016). Research has shown that pain and discomfort in various parts of the musculoskeletal apparatus are major problems in work environments or any other type of environment, as they are the main cause of work absence. Today, in many countries, the Prevention of work-related musculoskeletal disorders has become a national necessity and priority (Andersen et al., 2007).
The main goal of health and safety programs in the work environment is to prevent injuries and diseases by eliminating their causes. In ergonomics, this goal is to eliminate or reduce the user's exposure to ergonomic hazards that cause WMSDs. According to the US Bureau of Labor Statistics, 44% of occupational diseases are related to the musculoskeletal system, and in Finland, according to National Statistics (1994), this figure was 33% (Dutch, 1995). In Scandinavian countries, the cost of musculoskeletal disorders is estimated at 3 to 5 percent of GDP (David, 2005). This is while the ergonomics of the work environment in these countries has always been at a high level.
In Europe, it is estimated that 40 million workers suffer from WMSDs (more than 30% of the labor force), whose cost is 0.5 to 2% of the EU's gross product, which places a heavy cost on its shoulders (Ardianto, 2020). In industrially developing countries, research on WMSDs has also been conducted, among which the researches of Chavalestiakochai and Shahnawaz (1991 and 1993), Shirhat and colleagues (1995) can be mentioned (Ilbeigi et al., 2021). Sports equipment includes a wide variety of devices that are used in training and competition. The mentioned equipments are used to improve human capabilities, and skill in using them is an essential feature in sports. If the desired activity requires throwing or pulling human body parts, it should be designed according to the user in order to perform a safe and effective function. The user also has to adapt to their different designs when the throwing objects are legball, tennis or golf balls. The search for better and safer sports equipment has led to the use of more advanced technology in their design. Innovation in design has facilitated

performance, but sometimes the application of reforms requires changes in the current rules of the competition before progress can be realized (Goshgar, 2003).

If sports equipment meets individual needs and characteristics, during which physical stress is avoided, possible injuries can be prevented by proper design. Efforts to achieve safety in sports are one of the key actions, and attention to safety principles and Prevention of accidents caused by sports activities should be of high priority in all societies, especially in developing countries; therefore, the preservation of athletes is of great importance, both in terms of attention to human capital and in terms of preventing the waste of material resources (wich et al., 2016). Ford and tetrich (2008) stated in a study that between 50 and 90 percent of accidents and injuries are caused by human error or unsafe behavior. Therefore, one of the goals of sports managers should be to reduce the level of risk in sports environments (Edward and Nikolai, 2016). Risk is associated with ambiguity. The greater the amount of ambiguity and unknowns about a process or topic of interest, the greater the negative parameters as a threat factor that affect decision-making (Josie, 2009).

The main problem of the current research is to check the degree of compatibility of sports equipment and facilities located in the parks and recreational areas of Tehran. In principle, the researcher seeks to investigate the degree and level of risk of using sports equipment in the studied parks and to match their ergonomic principles and criteria with international standards in order to finally be able to provide a risk management model.

2. Methodology

This research is cross-sectional in terms of execution time and applied in terms of outputs, and in terms of data collection, it is of mixed type (library-field) and from the point of view of data analysis, it is descriptive-analytical. The community under study was public parks and amusement parks in the northeast of Tehran, including 13-8-7-4 areas and their users. In figure (1), the location of the study area is shown on the map. In each of the four regions, 2 parks were selected. In addition, 2 public recreation spaces were also investigated, which resulted in a total of 10 sites (Table 1). In the following, 3 devices were examined as pilots, which were:

1- Ship steering device (hand rotation)

2-elliptical device

3- Combined leg press machine + underarm

One of the reasons for choosing the mentioned devices is that because they are relatively new and exist in most gardens, they are among the devices that have a great demand for use and a wide range of users choose and use them.

The other is that according to the common hypotheses, these three devices are capable of causing more damage. On the other hand, in this research, an effort has been made to select devices that can measure all parts of the body. On the other hand, due to the large number of such devices, it was not possible to check all the cases. Also, 40 people were selected as study subjects in the research. The reason for choosing this number was that, firstly, these people agreed to carry out posture assessment and imaging, and secondly, due to the time-consuming nature of the assessment and the difficulty of the work, based on the studies of Chubineh et al. In addition, the sampling method was purposeful, in a way that included different ages and both genders (men and women).

Table 1. The names of the gardens to be measured

Row	District	The name of the park
1	District 4 of Tehran Municipality	police park
2		Yas Park
3	District 7 of Tehran Municipality	Andisheh Park
4		Taleghani Park (forest)
5	District 8 of Tehran Municipality	Fadak Park
6		Gulbarg Park
7	District 13 of Tehran Municipality	Khayyam Park
8		Avesta Park
9	Public recreation spaces	Loisan Forest Park (Region 4)
10		Xi'an Forest Park (Zone 4)

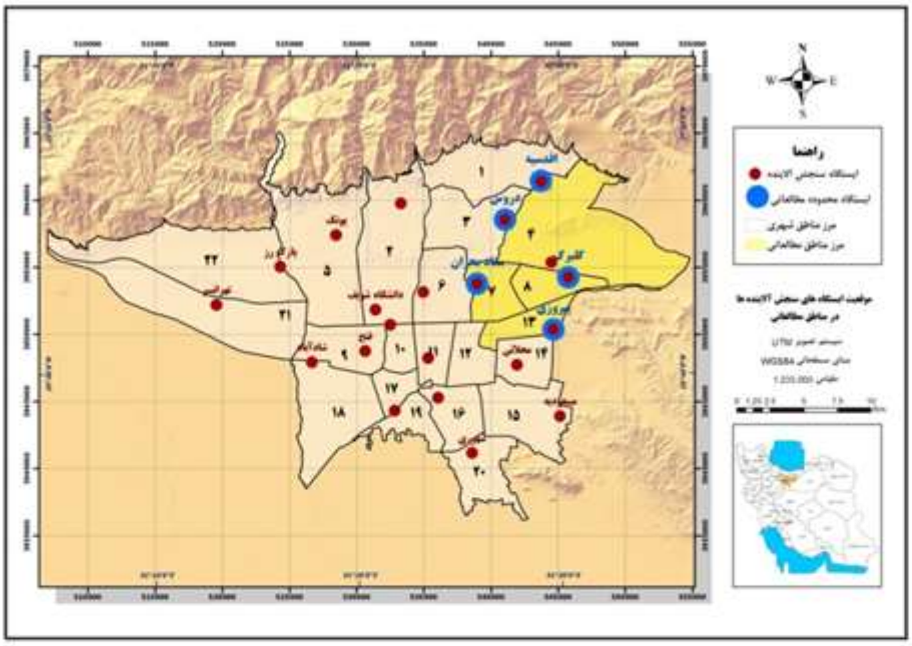

Figure 1. Location of study areas (4, 7, 8 and 13) on the map of Tehran city

The data collection tool was in two ways: library and field studies. In the library section, for basic information and theoretical foundations, authoritative and specialized internet sites and authoritative scientific centers were consulted. Then, in the field studies section, in order to obtain the required data from the field studies, the ergonomic evaluation checklist was used. In order to evaluate the ergonomics of the studied workstations, the REBA evaluation guide checklist was used. This checklist consists of assessment forms for head and neck areas, assessment of trunk, shoulders, arms and legs. The Reba method is one of the quick assessment methods for the analysis of musculoskeletal injuries for all physical activities in dynamic and static conditions. REBA is more than a body posture assessment tool; because it is designed to identify and identify the risk factors of musculoskeletal injury based on the needs of ergonomics, safety and occupational health professionals. The REBA was designed and presented to provide a rapid and quantitative method for assessing the risk of musculoskeletal injuries (Kay, 2020). Field observation and, in some cases, camera recording were used to gather data and to assess the body posture (Rapid Entire Body Assessment). The procedure was that after visiting the studied Gardens, users who were using the equipment were photographed and made available to the expert team. In order to increase the accuracy of the assessment and reduce the error rate, an experienced undergraduate team was used. So eight experts with experience in Occupational Safety and health, and the HSE, were invited to participate and monitor the evaluation process. The profile of the undergraduate team is shown in Table (2).

Table 2. Characteristics of the research expert team in the posture assessment department using the REBA method

Speciality	Number	Gender		Academic Degree		Work Experience		Post
		Female	Male	MA	Phd	10-15	15-20	
Occupational health and safety	5	1	4	3	2	3	2	- University faculty member - consulting engineer -Assessor of the Ministry of Health
HSE	3	1	2	3	–	1	2	

Due to the involvement of the hands and fingers, as well as the entire body during the performance of job tasks, the REBA method was the most suitable method for evaluating users. In this method, different parts of the body were divided into two groups A and B for analysis. Group A organs consisted of the trunk, neck, and legs, and Group B organs consisted of arms, forearms, and wrists, creating a total of 36 combined physical postures (Kang and Yang, 2018). First, The Points A and B were calculated, then by combining the two, the points C were determined and collected with the activity score and the final score was determined. After the final score was determined, the level of risk and priorities for corrective actions were determined. Score 1 means no corrective action is required. Score 2 or 3 means low risk and possibly need to change posture, score 4 to 7 indicates moderate risk, need for further studies and change of posture soon. A score of 8 to 10 indicates high risk, the need for further studies and rapid posture change. The score above 11 indicated a very high risk and a rapid change in posture. Then, the REBA checklist was used to evaluate and the information obtained was entered into the SPSS software. Figure (2) shows the raw form and step-by-step guide of this method.

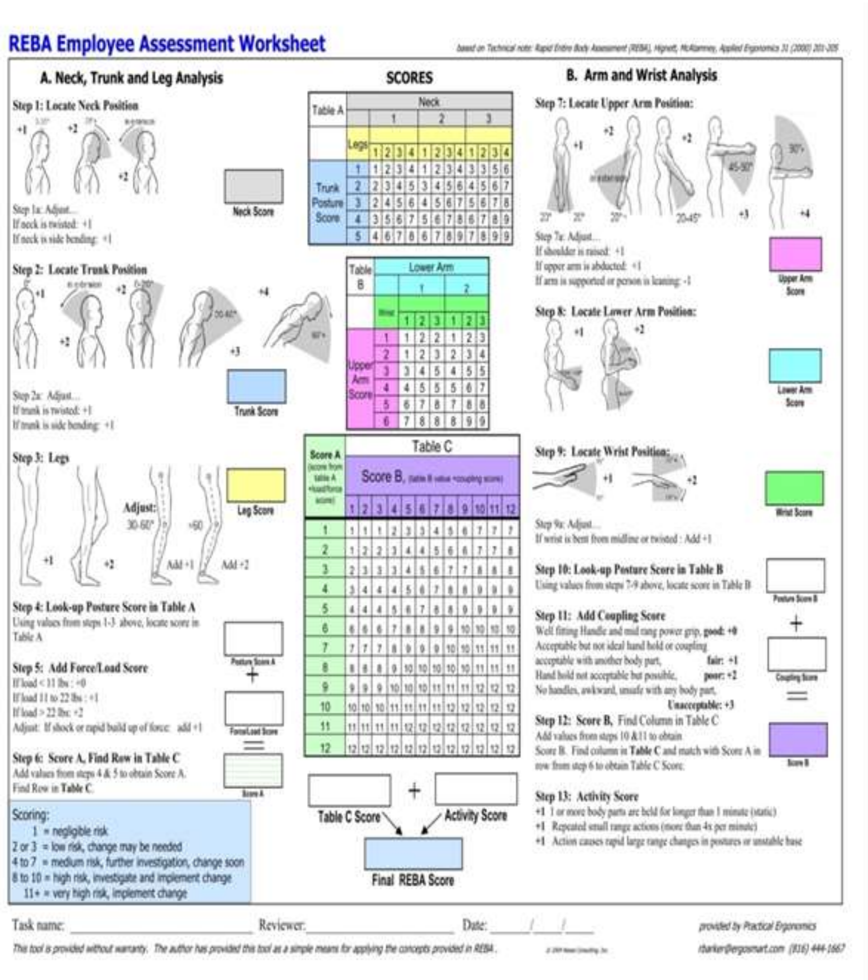

Figure 2. The raw form of the user body posture assessment checklist by the REBA method

Neufert's visual guide (2000) was then used to anthropometrize and determine the dimensions and sizes of sports equipment and determine their compliance or mismatch. In order to analyze the data, the William Fine method was used to evaluate the final risk, which includes the severity of the effect and the duration of Use and the likelihood of occurrence. In this method, the risk can be calculated from the product of the following three parameters (chobine et al., 2004):

$R = C \times E \times P$

In this regard:

R = Risk Rating
C = implication rate
E = contact rate
P = probability rate
Tables (3) to (6) are risk calculation guides.

Table 3. Outcome rate (C)

Description of risk consequence	Score
Multiple deaths-irreparable safety or health losses with long-term effects-high financial losses-very high percentage of error in Poster evaluation (more than 90% above the limit)	100
One person's death-irreparable safety or health damage with medium-term effects-high error rate in posture assessment (90-70% higher than the limit)	50
Damage to a person's permanent disability-irreparable damage to safety or health with short-term effects-relatively high error rate in Poster evaluation (70-50% higher than the limit)	25
Long-term injury without permanent disability-compensable damage to safety or health with long-term effects-average error percentage in posture assessment (50-30% higher than standard)	15
Temporary injury-compensable damage to safety or health with short-term effects-small error rate in posture assessment (30-10% higher than standard)	5
Minor injury requires first aid (3 days less) - very small error percentage in posture assessment (10-5% more than standard)	2
No need for further examination-no damage to health - a small percentage of error in the poster evaluation (eventually 5% more than the standard)	1

Table 4. Classification of the amount of contact / amount of use (E)

Description of contact and risk sequence	Score
Continuously – several times a day-call or use for more than 8 hours	10
Often – several times a week-call or use between 6 and 8 hours	6
Occasionally-fish several times-contact or use between 4 and 6 hours a day	3
Unusually – multiple times a year-call or use between 2 and 4 hours a day	2
Rarely – once a few years-contact or use between 1 and 2 hours a day	1
In part-very little-contact or use less than 1 hour a day	0.5
No contact-no frequency of occurrence	0.2

Table 5. Risk probability classification (P)

Description of the probability of occurrence	Score
It is often possible, because most users are exposed to secondary risks.	10
The chance of occurrence is 50-50. Because at least half of users are exposed to secondary risks or are vulnerable.	6
It can happen by accident (the chance of occurrence is less than 50%)	2
It probably won't happen until a few years after contact or use, but it could happen.	0.5
In practice, it is impossible (it never happens) to happen.	0.2

Table 6. Summary of risk rating and measures

Risk level	Actions	Rank
High Risk level	Urgent reforms are needed to control risk.	＞200
Medium Risk Level	Emergency (necessary attention should be taken as soon as possible)	9-199
Low Risk Level	The risk is monitored and controlled.	＜89

In this research, the risk management model is derived from the principles of Project Management (PMBOK, 2008). This phrase, in Persian, is translated into the range of knowledge of project management, or in a simpler form into knowledge of Project Management. PMBOK is the most well-known global standard in project management and is the most common criterion for evaluating project management systems (Rosebhay, 2014).

3. Findings

Posture evaluation results

The results of the REONOMIC evaluation based on the REBA model and according to the two groups A and B are presented in the following tables. A comparative graph of the error percentage of each physical condition for each device is also drawn.

Table 7. Frequency of REBA score in different parts of the body for combined leg and underarm press machine

Groups	Organs	Code	Number	Percentage	Interpretation of Evaluation
Oragans of Group A	Body	1	10	25%	Permissable
		2	18	45%	impermissible
		3	12	30%	impermissible
		4	-	-	impermissible
		5	-	-	impermissible
	Neck	1	5	22%	Permissable
		2	9	22%	impermissible
		3	26	56%	impermissible
	Leg	1	-	-	Permissable
		2	4	10%	Permissable
		3	10	25%	impermissible
		4	26	65%	impermissible
Organs of Group B	Arm	1	-	-	Permissable
		2	-	-	Permissable
		3	-	-	Permissable
		4	32	80%	impermissible
		5	-	-	impermissible
		6	8	20%	impermissible
	Wrest	1	-	-	Permissable
		2	24	60%	impermissible
		3	16	40%	impermissible
	Fitness	1	29	72%	Permissable
		2	11	18%	impermissible
		3	-	-	impermissible
		4	-	-	impermissible
		5	-	-	impermissible
Weight score=2					

As shown in the graph, the highest percentage of posture errors for the" arm "and" wrist" were recorded, which were observed in all the samples evaluated, high and unauthorized errors. The lowest posture error rate also belonged to" trunk" (75%). Plus, the "clutching" mode was in most cases (72 per cent) in the permissible condition.

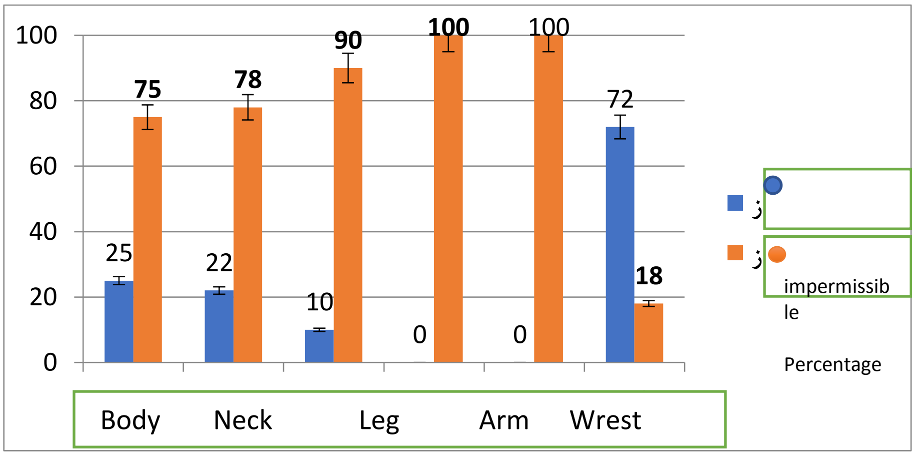

Figure 3. Comparative chart of permissible and illegal percentage of body posture in the leg and underarm press machine

Table 8. Frequency of REBA score in different body parts for elliptical machine

Groups	Organs	Code	Number	Percentage	Interpretation of Evaluation
Oragans of Group A	Body	1	-	-	permissible
		2	5	12%	impermissible
		3	15	38%	impermissible
		4	15	38%	impermissible
		5	5	12%	impermissible
	Neck	1	13	33%	permissible
		2	20	50%	impermissible
		3	7	17%	impermissible
	Leg	1	12	30%	permissible
		2	5	12%	permissible
		3	9	22%	impermissible
		4	14	36%	impermissible
Oragans of Group B	Arm	1	-	-	permissible
		2	7	17%	permissible
		3	12	30%	permissible
		4	8	20%	impermissible
		5	5	12%	impermissible
		6	8	21%	impermissible
	Wrest	1	20	50%	permissible
		2	15	38%	impermissible

		3	5	12%	impermissible
	Fitness	1	29	72&	permissible
		2	11	18%	impermissible
		3	-	-	impermissible
		4	-	-	impermissible
		5	-	-	impermissible
Weight score = 1					

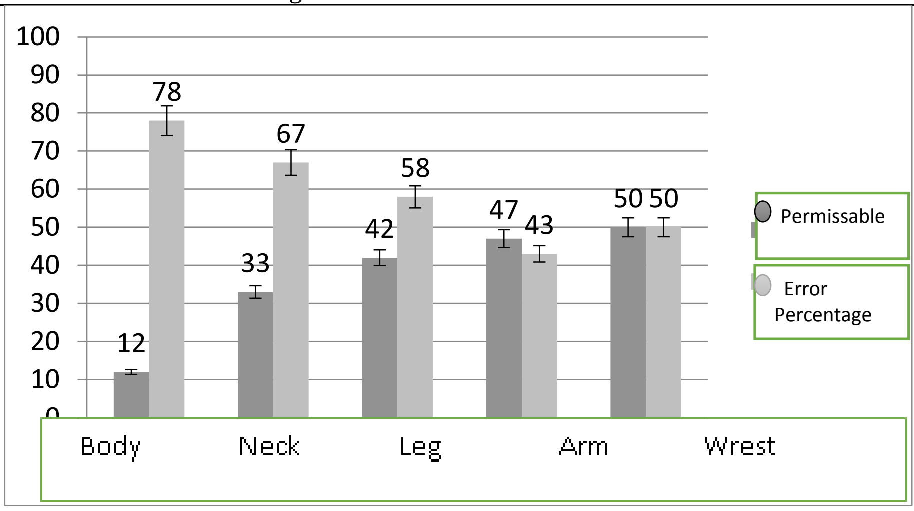

Figure 4. Comparative diagram of permissible and illegal percentage of body posture in the elliptical machine

As can be seen, the highest poster error rate was that of the "trunk" organ with 78 percent, followed by the neck with 67 percent. Also, the lowest percentage of posture error is the "arm" (43 percent). The notable thing about the organ is the "wrist", which is equal to the percentage of allowed and unauthorized postures (50-50%). Plus, the "clutching" mode was in most cases (72 per cent) in the permissible condition.

Table 9. Frequency of REBA score in different body parts for rotary ship rudder

Groups	Organs	Code	Number	Percentage	Interpretation of evaluation
Group A Organs	Body	1	7	17%	permissible
		2	33	83%	impermissible
		3	-	-	impermissible
		4	-	-	impermissible

		5	-	-	impermissible
	Neck	1	6	15%	permissible
		2	21	52%	impermissible
		3	13	33%	impermissible
	Leg	1	14	35%	permissible
		2	18	45%	permissible
		3	8	20%	impermissible
		4	-	-	impermissible
Group B Organs	Arm	1	-	-	permissible
		2	-	-	permissible
		3	10	25%	permissible
		4	12	30%	impermissible
		5	10	25%	impermissible
		6	8	20%	impermissible
	Forearm	1	-	-	permissible
		2	40	100%	impermissible
	Wrest	1	28	70%	permissible
		2	6	14%	impermissible
		3	7	16%	impermissible
	Fitness	1	29	73%	permissible
		2	11	27%	impermissible
		3	-	-	impermissible
		4	-	-	impermissible
		5	-	-	impermissible
Weight score = 0					

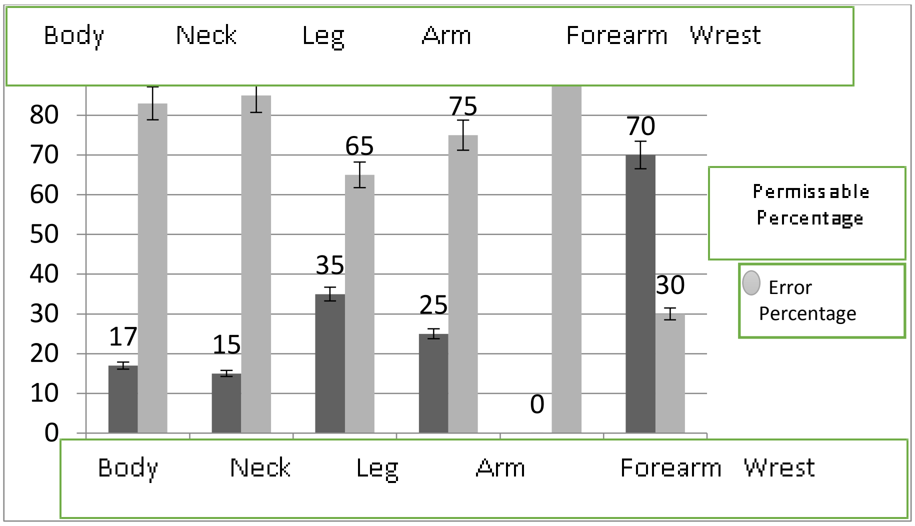

Figure 5. Comparative chart of allowed and illegal percentage of body posture in rotary ship steering device

As shown in Table (9) and Figure (5), the highest percentage of posture error, in the ship's rudder, belongs to the "forearm" organ (100%) and then the posture is related to the "neck" (with 85%), and the lowest posture error is also related to the "wrist" organ (30%). The "swing" mode was in the permissible condition in most cases (73%). At the end of this section, a comparative graph of the percentage of error posters (unauthorized) for each Sports device is presented (Figure 6). It is noteworthy that the member of the "forearm" was affected only in the sports vehicle of the ship's rudder, and in two other devices, this member was not involved. On the other hand, the only exercise device that lacks an unauthorized 100% position for any part of the body is the elliptical device. So that in 2 other devices, a 100% error is observed (for the wrist and forearm). Also, in all 3 sports devices, the grip mode was in the permissible condition in most cases.

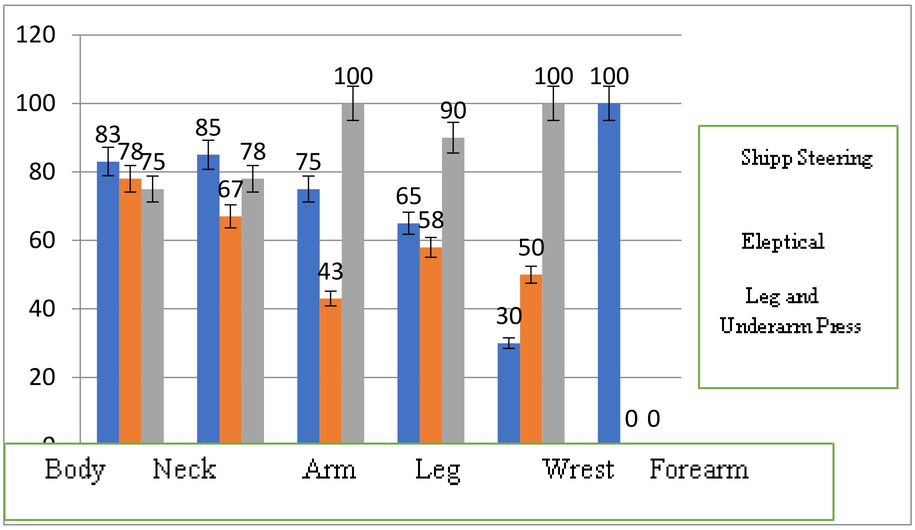

Figure 6. Comparative graph of the percentage of unauthorized postures in body posters for studied sports devices

In Table (10), the risk level of each device is calculated and listed according to the REBA method instruction manual. The results show that working with the Rotary ship rudder has a very high risk (risk number above 13). After that, the device "leg and underarm Press" has a high risk level (risk number 9). Finally, the "elliptical" device has an average risk level (risk number 6).

Table 10. Risk level of the assessed devices

Device name	Risk rate	Risk Level
Leg press and underarm	**9**	High
Eleptical	**6**	Medium
Rotating ship steering	**13**	Very high-Critical

Evaluation guide:
1=acceptable risk
2 or 3 = low risk
4 to 7 = average risk
8 to 10 = high risk
11 and up = very high risk and critical mode.

3.1. Risk Assessment

Since the REBA posture assessment does not allow the risk level to be calculated based on the time of use of equipment, it is forced to use a complementary risk assessment method. To this end, a quantitative risk assessment method called William fine was used.

3.1.1. Risk Assessment of the Ship Steering

According to the research data, and since the percentage error of the posture assessment for this sports device was higher than 90% in one case, the score obtained for the consequence rate was considered 100%. Also; in order to determine the amount of contact or use of the means, the guide contained in Table 3-5 was used. Since according to the questionnaires obtained from users, the most time to use the device was 15 minutes, therefore, a score of 5/0 was considered for this parameter. The guide listed in Table 3-6 was also used to discuss the likelihood of risk. Given that the poster evaluation of the ship's rudder showed a high percentage of errors (more than 70%) in the case of the trunk, neck, arm and forearm, as well as the results of user questionnaires indicating that 15% had a history of lumbar disc surgery, 25% reported pain in the shoulder, 5/57% back pain, 5/27% pain in the neck and back, and 35% reported pain in the hand and wrist. Therefore, a score of 2 was recorded for this parameter. Finally, the risk rating for the ship's rudder was obtained by multiplying the above parameters (table 11).

Table 11. Results of the risk assessment of the ship's Steering by William Fine

The outcome rate (C)	**Contact/usage (E) rate**	**Risk probability (P)**	**Risk rating/level**
Very high error rate in Poster evaluation (over 90% above the limit)	In part-very little-contact or use less than 1 hour a day	It can happen by accident (the chance of occurrence is less than 50%)	The level of risk is moderate. Emergency action (due consideration should be taken as soon as possible)
100	0.5	2	100

3.1.2. Risk assessment of the Elliptical Device

According to the research data, and since the percentage error of the posture assessment for this sports device was not higher than 90% in any case and only 70% to 90% in one case, the score obtained for the consequence rate was considered 50%. Also; in order to determine the amount of contact or use of the means, the guide contained in Table 3-5 was used. Since according to the questionnaires obtained from users, the most time to use the device was 15 minutes, therefore, a score of 5/0 was considered for this parameter. The guide listed in Table 3-6 was also used to discuss the likelihood of risk. Considering that the evaluation of the posture of the elliptical device indicated a high percentage of error (more than 70%) in the case of the "trunk" organ, as well as the examination of the results of the questionnaires of users, which indicated that 15% of them had a history of lumbar disc surgery, 25% reported pain in the shoulder and back and 5/27% pain in the neck and back, therefore, a score of 2 was recorded for this parameter. Finally, the risk rating for the elliptical device was obtained by multiplying the above parameters (table 12).

Table 12. The results of the William Fine elliptical risk assessment
The outcome rate (C)   Contact/usage rate

The outcome (C) rate	**Contact/usage rate (E)**	**Risk probability (P)**	**Risk rating/level**
High percentage of error in posture evaluation (90-70% more than the limit)	in part – very little-contact or use less than 1 hour a day	Can happen by accident (the chance of occurrence is less than 50%)	The risk level is low. The risk is monitored and controlled.
50	0.5	2	50

3.1.3. Risk Assessment of the Leg and Underarm press

According to the research data, and since the percentage of error in the posture assessment for this sports device was higher than 90% in 3 cases, the score obtained for the consequence rate was considered 100. Also; in order to determine the amount of contact or use of the means, the guide contained in Table 3-5 was used. Since according to the questionnaires obtained from users, the most time to use the device was 15 minutes, therefore, a score of 5/0 was considered for this parameter. The guide listed in Table 3-6 was also used to discuss the likelihood of risk. Considering that the poster evaluation of the leg and underarm presses indicated a high percentage of error (more than 70%) in the case of the trunk, neck, arm, leg and wrist, as well as the results of the user questionnaires indicating that 15% had a history of lumbar disc surgery, 25% reported pain in the shoulder and back, 5/27% pain in the neck and back, 55% knee pain and 35% pain in the hands and wrists. Therefore, due to a percentage above 50% of one of the disorders (knee pain), a score of 6 was recorded for this parameter. Finally, the risk rating for the leg and underarm Press was obtained by multiplying the above parameters (table 13).

Table 13. The results of the risk assessment of the underarm and leg press machine according to the

The outcome (C) rate	Contact/usage rate (E)	Risk probability (P)	Risk rating/level
Very high percentage of error in posture evaluation (more than 90% higher than the permissible limit)	Partially - very little - contact or use less than 1 hour per day	The chance is 50-50. Because at least half of users are exposed to secondary risks or are vulnerable.	The risk level is high. Urgent reforms are needed to control the risk.
100	0.5	6	300

3.2. Rank and Risk Level of Sports Equipment

The rank and risk level of the sports equipment studied were evaluated based on 2 separate methods. The results indicate that in both evaluation methods, the lowest level of risk assessed belonged to the elliptical device. But the results of the methods used differ between the highest risk levels assessed for the sports devices studied. So in the posture assessment method (REBA), the ship's Rudder had the highest degree of risk (very high), whereas according to the William fine assessment method, the leg and underarm Press showed the highest level of risk (table 14).

Table 14. The results of the risk assessment of the studied sports devices by William Fine and REBA methods

Device name / Evaluation method	Ship Steeing	Elliptical	Leg press and underarm
REBA	Very high risk level	Medium risk level	High risk level
William Fine Medium	Medium risk level	Low risk level	High risk level

Examining the results shows that in none of the investigated sports equipment, the principles and rules of ergonomics have not been properly observed (Table 15).

Table 15. Cases of non-compliance of sports equipment with the principles and rules of ergonomics

Device name	Cases of non-compliance
Leg press and underarm	- The impossibility of increasing or decreasing the distance of the leg from the device in a stretched position. - The knee joint can be folded to less than 45 degrees. - The impossibility of changing the height of the seating area from the ground level. - The impossibility of increasing or decreasing the height of the upper part of the toy. Excessive opening of the angle of the underarm (arm and trunk) more than 65 degrees
Elliptical	-Additional hand and leg movements. The impossibility of changing the distance of the handle on the arm of the device - The impossibility of increasing or decreasing the resistance of the device.
Ship Steering	The inability to increase or decrease the distance of the hands to the device. Additional rotations of the arm and shoulder axles Excessive opening of the angle of the underarm (arm and trunk) over 65 degrees

3.3. Risk Management

The first step in the risk management process is" risk identification and determination", followed by" risk assessment "and further," risk analysis", which is done in this study every 3 steps.

According to the results of the evaluations made on sports equipment, it can be noted that the two devices "ship rudder" and "leg and underarm press" have a high risk level, and the "elliptical" device has a lower risk level compared to them.

Accordingly, in the fourth step, called the "risk reaction", which requires corrective and reactive actions that must be voiced by managers and supervisors, and in the final step (Fifth), Risk Response Control or" feedback and monitoring" is carried out. The research used the principles of Project Management (PMBOK, 2008). Based on this, control measures can be expressed in the form of Figure (7).

Figure 7. Risk management structure in PMBOK system

According to each of the categories mentioned, the proposed solutions can be expressed.

A) Aggressive strategies (leverage-with an approach to strengthening strengths and taking advantage of opportunities):

- Study in order to design and install new and standard devices and equipment that fully comply with ergonomic principles;

* Application of sports equipment with an aerobic approach instead of existing equipment.

(B) Defensive solutions (identifying problems-with the approach of eliminating weaknesses and avoiding threats):

*Removal of the Rotary ship's rudder from public environments and parks due to the high risk of the vehicle؛

*Deformation and engineering modification of the leg and underarm press؛

* Avoid bending the neck during work and placing the head and neck under normal conditions؛

* Avoid frequent bending and stretching of the body, especially in the shoulder and Arm area؛

c) Conservative solutions (change of direction - with the approach of using opportunities to avoid threats):

· Teaching users how to perform sports movements in the correct way by experienced sports coaches;

· Creation of a specialized working group in order to evaluate and monitor sports equipment and devices located in urban public spaces.

t) Combined solutions (with the approach of integrating the aforementioned three components):

· Designing sports equipment in an adjustable form according to the physical dimensions of the users;

· Establishing permanent trainers next to the tools and equipment and allocating a specific time to use the tools with the presence of the trainer.

4. Discussion

In the interpretation of the results obtained from the evaluation of the physical condition of the body by the REBA method, the larger the resulting number, the greater the distance from the normal state of the organ and the higher the risk level. In this way, based on the findings of score A, which is related to the physical condition of the body (trunk, neck and legs), 18% of the samples received a score of 6, 12% of the samples received a score of 7, and 30% of the samples received a score of 8. 40% of the samples scored 9, the highest percentage of which is 45% of the samples have a score of 9.

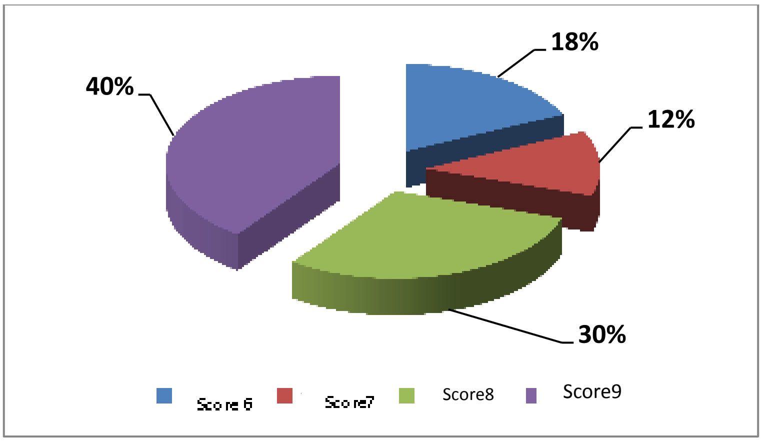

Figure 8. Relative frequency of A score codes for the total of three sports devices

In the case of group B, which is related to the physical condition of the body (arms, forearms and wrists), the results are as follows:

respectively, in 7% of samples 2 points, in 3% of samples 3 points, in 18% of samples 4 points, in 22% of samples 5 points, in 30% of samples 6 points, in 15% of samples 7 points and in 5 The percentage of samples was recorded as 8 points, with the highest percentage, i.e., 30% of the samples, having 6 points.

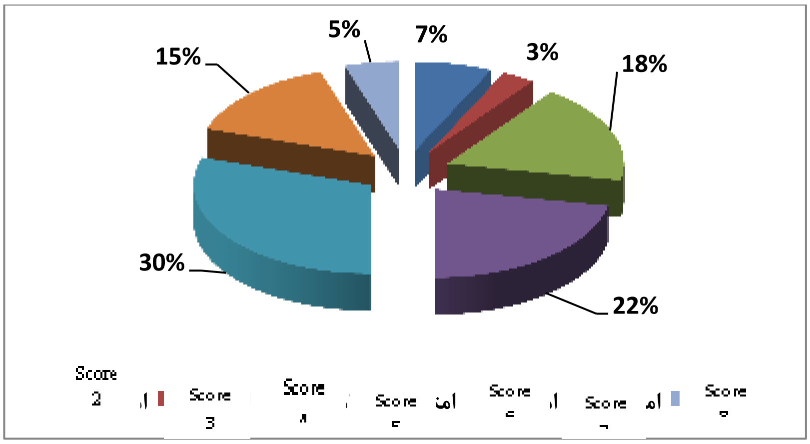

Figure 9. Relative frequency of B score codes for the total of three sports devices

In the interpretation of the final points obtained, points 8 to 10 are considered high risk, and in terms of priority level, corrective measures are in status 3, and corrective measures are defined for them as necessary (as soon as possible) and should be implemented. Their condition should be corrected immediately. Otherwise, the risk of causing musculoskeletal injuries is certain. Scores higher than 11 also have a very high risk level, which is defined by the priority level of corrective actions 4 and corrective action as necessary (immediate). The interpretation of this issue is that the risk of developing musculoskeletal injuries or MSDs in people whose final physical condition score is more than 11, if the current condition continues, is very high. As presented earlier, the rating and risk level of the studied sports devices were evaluated based on 2 separate methods. The results show that in both evaluation methods, the lowest level of assessed risk belonged to the elliptical device. But regarding the highest level of risk assessed for the studied sports devices, the results of the methods used are different from each other. So that in the posture evaluation method (REBA), the ship's rudder device has the highest level of risk (very high), while according to William Fine's evaluation method, the leg press and underarm device have shown the highest level of risk.
One of the main reasons for this difference is that the posture assessment method (REBA) does not have the possibility to assess the duration of exposure and only assesses the posture at a certain point in time. On the

other hand, William Fine's assessment method has this capability and allows risk assessment in the time period used. On the other hand, William Fine's method does not have the ability to calculate the pressure on body parts and mainly focuses on the results of the process; while the REBA method has this capability. In general, it seems that the combined use of these 2 methods provides more accurate results. The current research, in terms of the methodology and tools studied, is not similar to any of the previous researches; but in terms of approach, it can be compared and analyzed with some of the researches that have been done in the past, which are mentioned below:

The results of the present research are in line and similar with the study of Mokakni et al. They also came to the conclusion that the 2 investigated devices (of which only 1 is similar to the present research) are problematic for the women under study and are not suitable for users in terms of anthropometrics. On the other hand, the research of Ilbigi et al. (2021) and Nazarizadeh and Heydari (2015) is similar to this research. Because in all these researches, it was found that the devices are not ergonomic from the anthropometric point of view of the users, and it seems necessary to adopt a method to standardize these devices. This disproportion can cause complications and physical injuries to users. Therefore, users should be careful when using these devices and avoid working with devices that do not fit their body dimensions. Also, the results of the research are consistent with the study of Nazarizadeh et al. (2014). Although the measured devices were different. On the other hand, as Hosseinpour et al. (2018) and Daneshyar et al., (2021) stated, the need to comply with safety and health standards in sports environments is a necessity. Of course, it should be noted that the only thing that was evaluated relatively favorably in all the three examined devices was its grip, or in other words, the way to hold the sports equipment. Therefore, this case has been the most compatible with the dimensions and sizes of the users' bodies, which, of course, was not discussed in any of the previous researches.

4. Conclusion

The evaluation of the three devices in this study showed that all three devices are not in a favorable position in terms of anthropometry. Why aren't they designed in the right dimensions and sizes and have the ability to change and be flexible to fit different users? In addition, the results showed that most users of such devices are retired and elderly people who suffer mainly from physical and skeletal – muscular injuries and problems. Although the study does not confirm the direct or significant relationship between the use of such devices and the problems, it is important to note that due to other research results that indicate high risk for the use of sports equipment, concerns can be expressed about the continuation of the use of such devices in people with skeletal – muscular problems in the current situation.The results of this study showed that for all 3 devices studied, theگonomic risk level is moderate to high and there is a possibility of skeletal – muscular injuries. So that the physical condition of the work is not in good condition and it is necessary to take measures to improve their condition to reduce the likelihood of skeletal – muscular discomfort. The practical suggestions presented in this field are mentioned in the form of management solutions in Chapter Four. But in more detail they are:

- Conduct a comprehensive study of the health measurement of all tools used in parks and public spaces؛
- Removal of hazardous equipment from Parks and public spaces؛
- Special training courses for municipal sports coaches؛
- Transfer of relevant training to Sports users.

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